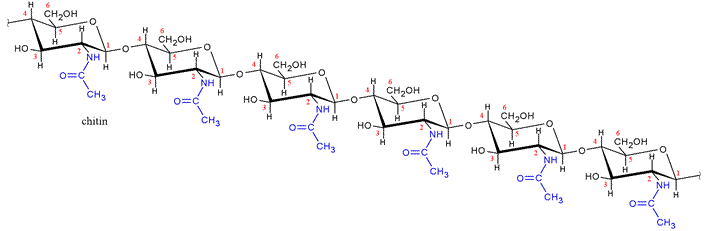
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**Connecting Structure to Function in Carbohydrates and Lipids**

Ms. OK, AP Biology, 2014-2015

Below is a picture of a chitin molecule, which is found in the exoskeleton (i.e. the hard outer skeleton) of insects and crustaceans (ex: crabs). Chitin is also used in surgical thread (SO COOL!) because it is strong and biodegradable (i.e. breaks down naturally in the body).



Chitin is made of modified glucose monomers with one hydroxyl group replaced with an acetyl amine group (contains nitrogen). Within chitin, the glucose monomers are linked together by 1,4 beta linkages. Hydrogen bonding occurs between the acetyl amine groups on adjacent chitin molecules.

1. Answer the following questions about chitin given below based on the information and image in the passage above.

A. Is chitin a carbohydrate or lipid? How do you know?

Chitin is a carbohydrate because it is made of a chain of glucose monomers, which are carbohydrates.

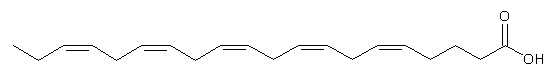
B. Is chitin a monomer or a polymer? How do you know?

Chitin is a polymer because it is a chain of monomers.

C. Explain how the structure of chitin contributes to its function.

Because hydrogen bonding occurs between the acetyl amine groups on adjacent chitin molecules, multiple chitin chains can form a thick fiber. The thick fiber provides the strength necessary for chitin to be used in insect exoskeletons.

Below is a picture of EPA (Eicosapentaenoic acid), a molecule found in fish (especially salmon). Humans often take this molecule as a supplement to assist with joint pain due to inflammation, arthritis, etc. In the image below, any bend in the line represents a carbon atom. Where there are two lines, this represents a double bond between two carbon atoms. Hydrogen atoms are assumed to be branching off the carbon atoms in the chain, though they are not shown in the image.



2. Answer the following questions about EPA given below based on the information and image in the passage above.

A. Is EPA a carbohydrate or lipid? How do you know?

This is a lipid because it is mostly a chain of carbon atoms with hydrogen atoms branching off (i.e. a fatty acid chain).

B. What can you infer about the type of carbohydrate or lipid based on the presence of carbon to carbon double bonds in this molecule?

This is an unsaturated lipid.

C. Would this molecule be solid or liquid at room temperature, and how do you know?

Because it is unsaturated, there will be bends in the fatty acid chain at the locations of double bonds. This causes these chains to stack very loosely on top of one another, which makes them liquid at room temperature.

D. Would consuming this molecule be negative for human cardiovascular health? Why or why not?

No, unsaturated lipids do not contribute to the formation of plaques in blood vessels, which can clog them and result in heart attack or stroke.

E. Would this molecule be attracted to or repelled by water? How do you know?

This molecule would be repelled by water because it is nonpolar. Lipids contain mostly carbon to carbon and carbon to hydrogen bonds, which are both nonpolar.